SOIL SURVEY OF THE STANTON AREA, NEBRASKA.

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LOCATION AND BOUNDARIES OF THE AREA.

The Stanton area lies in the northeastern part of Nebraska, and is distant about 40 miles from the Missouri River and the South Dakota line on the north and the same from the Missouri River and the Iowa line on the east. The area includes Norfolk and Warnerville townships in Madison County; Spring Branch, Elkhorn, Stanton, and Dewey townships in Stanton County; Hancock and Hoskins townships in Wayne County, and South Branch Township in Pierce County.

It is situated between the parallels 41° 52′ and 42° 10′ north latitude

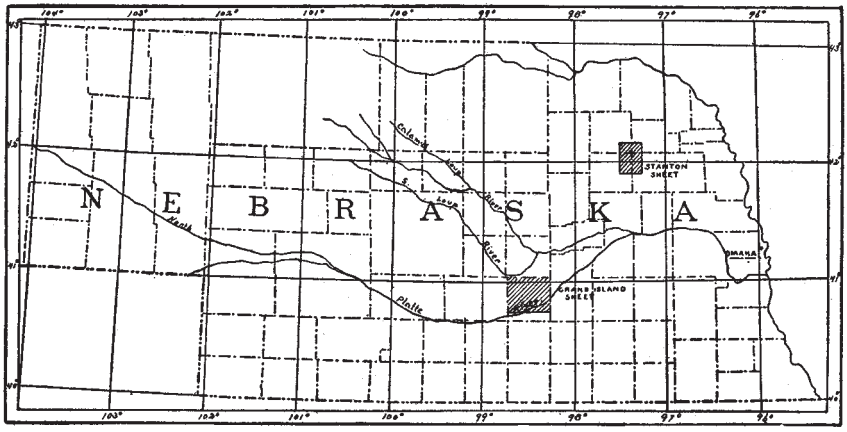

FIG. 47.—Sketch map showing location of the Stanton area, Nebraska.

and the meridians 97° 7′ and 97° 28′ west longitude. It is approximately 18 miles from east to west and 18 miles from north to south, and contains about 323 square miles, or 206,592 acres.

HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

The first settlement of any moment within the territory comprised in the area surveyed was made in 1866, in which year a colony of Germans from Wisconsin took up land on both sides of the North Fork of the Elkhorn River, near where the town of Norfolk now stands.

This colony consisted of 24 families and numbered in all 125 men, women, and children. They arrived in the area too late in the season

to plant crops, but game was very plentiful, and with the stores they brought with them and those obtained from the nearest point of supply, 65 miles distant on Logan Creek, they managed to subsist. The first wheat was planted in the spring of the following year and proved very successful, and, although the succeeding winter was very severe, causing unusual suffering, and the Indians were troublesome, the colony passed through the ordeal and became firmly established.

In 1868 the lands in this part of Nebraska were opened to settlement under the homestead act, and even as late as 1879 there was still some Government land to be had in this way, notwithstanding the fact that large tracts of the best lands had come into the possession of speculators.

In 1874, 1875, and 1876 the agricultural industry received a severe check through the destruction of crops by grasshoppers, and so great was the discouragement caused by this pest that many farmers sold their farms and moved away.

The next event of marked importance to the area was the building of the Elkhorn, Fremont and Missouri Valley Railroad, now the Chicago and Northwestern. This road was put in operation in 1879, and was followed by the Republican branch of the Union Pacific, and later by the Chicago, St. Paul, Minneapolis and Omaha Railroad, and the Creighton branch of the Chicago and Northwestern.

These roads have all had great influence on the progress and wealth of the area. At the time of opening the Government lands to settlement $1.25 an acre was the price at which they could be purchased. Twelve years later, or about the time of completion of the railroads, the price had advanced decidedly, ranging from $2 to $12 an acre, the latter price being asked for fairly well improved properties. At the end of another 12-year period the price of the cheaper lands had increased seven times and of the best lands two and a half times, and barring the years of drought and depression, from 1893 to 1895, inclusive, values have steadily increased to the present time.

Wheat and corn from the beginning have been the important agricultural products in this area. Hay has also been produced to a considerable extent. In 1887 there were four times as many acres planted to corn as to wheat.

In 1890 a beet-sugar factory was built at Norfolk and a flourishing sugar-beet industry has grown up in the surrounding territory. This has added not a little to the progress and prosperity of one of the richest agricultural communities in Nebraska.

CLIMATE.

The Stanton area has a healthful climate throughout the entire year. It has an elevation from 1,460 to 1,650 feet above sea level. The atmosphere is usually dry, with a high percentage of sunshiny days.

The following table, compiled from the records of the Weather Bureau stations at Norfolk, Hartington, and Madison, gives the normal monthly and annual temperature and precipitation. The mean annual temperature is about 48°, with a range during the last nine years from 108° F. down to −35° F. The mean annual rainfall is not far from 27 inches. This is a light precipitation for a humid region, but it will be observed that the greater part of the rainfall comes during the period from May to September, when it is most needed by the crops.

Normal monthly and annual temperature and precipitation.

Month.	Hartington.		Norfolk.		Madison.	
	Temperature.	Precipitation.	Temperature.	Precipitation.	Temperature.	Precipitation.
	°F.	*Inches.*	°F.	*Inches.*	°F.	*Inches.*
January	18.0	0.79	18.1	0.28	25.0	0.40
February	17.6	.94	20.7	.74	21.8	.47
March	29.6	1.72	30.2	1.04	30.6	1.01
April	48.0	3.54	47.8	2.66	49.8	3.50
May	58.5	4.22	59.2	3.75	59.9	3.69
June	68.6	4.45	68.5	4.54	69.0	5.30
July	74.2	3.02	74.0	3.60	74.7	3.39
August	71.5	2.85	72.2	3.60	72.7	3.07
September	63.0	2.49	63.4	3.26	63.8	2.65
October	50.7	1.48	50.2	1.49	50.9	2.14
November	32.1	.98	32.6	.63	33.5	.78
December	23.2	1.17	23.7	.64	25.0	.77
Year	46.3	27.65	46.7	26.23	48.0	27.17

The warmest month is July and the coldest month is usually January or February. The summer heat is tempered considerably by the breezes which blow much of the time, while the intense cold of the winter season is augmented by the prevailing strong winds of that season. Occasionally during the summer months the temperature falls suddenly and a raw, disagreeable day is the result.

Thunderstorms occur throughout this region during the summer season and wind and lightning do some damage to property, in consequence of which many of the farmers keep their buildings and stock insured against lightning, wind, and tornadoes.

During the last nine years the latest killing frosts in spring occurred May 5 at Madison and May 24 at Norfolk, while the earliest in fall occurred September 13 at both these stations. The average date of occurrence is for Madison, spring, April 24; fall, September 25; and for Norfolk, spring, May 5; fall, September 27.

This gives an average growing season of about one hundred and forty-nine days. The winter season is long enough and severe enough to allow the ground to become frozen to considerable depths, and in many seasons spring plowing and planting are delayed from this cause.

PHYSIOGRAPHY AND GEOLOGY.

The general slope of surface in the Stanton area is from west to east, and the elevation above sea level ranges from 1,460 feet at the southeast to about 1,650 feet on the northwest side.

The area naturally falls into three physiographic divisions. The first of these comprises the gently to very rolling areas found in the extreme southern, southwestern, and central-northwestern parts of the area, all of which country is covered by the Miami fine sand. These parts of the area rise from 10 to 80 feet above the bottom land, and are characterized by a number of low sand hills.

The second division includes the low, level, and sometimes slightly rolling strip of land along the Elkhorn River. This has an elevation ranging from 8 to 10 feet above the normal water level of the river, and parts of it are subject to inundation during the spring. This strip of land varies from 2 to 4 miles in width and extends entirely across the survey.

The third division, and by far the largest and most important, comprises the country in the northeastern and central parts and, to a less extent, the northwestern part of the survey. Here the surface is very rolling and hilly. It is traversed by a number of small streams which have cut deep ravines, and, in general, is very much eroded. The elevation of this part of the area above the bottom land ranges from 10 to 150 feet. In this division the Marshall silt loam is the predominating soil type.

Well water is found in the valleys at a depth of from 12 to 25 feet and on the uplands at from 35 to 125 feet below the surface. A few springs are found in various parts of the area, and in the valley there are a few bayous representing old channels of the river, which influence surface water conditions.

The Elkhorn River is the principal stream in the area surveyed, and with its tributaries forms an excellent drainage system. It is formed by the South Fork and the North Fork, which unite about 4 miles southeast of Norfolk. This river meanders through the broad valley, traveling about 3 miles in making 1 mile of actual advance. Although a sluggish stream, it furnishes some water power. Spring Branch is the largest of the several smaller tributaries of the Elkhorn in this area.

The geology of this area is simple and has a direct bearing on the different soil types found here. So far as at present known only one era is represented, namely, the Quaternary, and in this era we have but four subdivisions—glacial drift, loess, sand hill, and alluvium.

Glaciation extended over this area, the terminal moraine lying just west of the western boundary of the survey, but only some small patches of glacial pebbles and clay are found uncovered, these occurring on a few hills in the Marshall silt loam and Miami fine sand areas.

This material was only a few feet thick and in small patches, and did not give rise to any soil type. The most important formation in this area, as far as the soils are concerned, is the loess. This material extends over the greater part of the area and gives rise to one distinct soil type—the Marshall silt loam. Loess, according to Prof. E. H. Barbour, State geologist, covers the greater part of eastern Nebraska. It is a soft, fine sandy loam, with a very large admixture of very fine sand and silt and considerable calcareous matter. It lies in a very uniform bed, with an average thickness of about 100 feet, taking the entire deposit into consideration, and it is also very deep in this area. Being soft, it washes rapidly, and as a result the surface in some sections is very hilly and rolling.

The loess, dug fresh from a well and thrown on the ground, sustains vegetation at once, and quickly changes from bright buff to a darker color. This change is supposed to be due to the amount of humic matter and to the oxidation of certain mineral matter contained in the material. A large quantity of small, irregular lime nodules is also found scattered through the loess. There are differences of opinion as to the origin of loess, but it may be viewed as the result of the closing act in glaciation. Some view the wind as the chief agent in the distribution of the fine material, since the loess is laid evenly over hills and hollows alike, but it is evident that the action of water has also played some part in the preparation and deposition of the fine particles forming the deposit.

The remaining two formations are the sandhills and alluvium. The fine sand of the area, mapped as Miami fine sand, is likely a wind-blown material, having been transported from the more sandy regions of the western part of the State, where it is probably derived from the Arikaree formation of sandstone. The alluvium, which represents the level land along the Elkhorn River, has been formed from hill soils such as the two types in this area, as the river flows through similar soils from its source.

SOILS.

Four types of soil were mapped in the Stanton area. The extent of each type and the proportion that each forms of the area surveyed are shown in the following table:

Area of different soils.

Soil.	Acres.	Per cent.
Marshall silt loam	102,720	49.7
Miami fine sand	56,576	27.4
Elkhorn silt loam	25,152	12.1
Arkansas fine sandy loam	22,144	10.7
Total	206,592	.....

MARSHALL SILT LOAM.

The Marshall silt loam, locally called "clay land," to a depth of from 10 to 15 inches consists of a dark-gray silty to very fine sandy loam. The surface soil in some places contains a few lime concretions and in the more gently rolling areas a considerable proportion of organic matter. There are some small strips of this soil lying along the streams, where it is 2 or 3 feet deep and where the content of vegetable matter is much greater than in the typical areas. This soil when wet acts very much like a clay, being very plastic and tenacious. It packs very smoothly in the roads, and the subsoil has been used in the manufacture of bricks. A few knolls of glacial gravel and bowlder clay are exposed in this formation both northwest and northeast of Norfolk.

The subsoil is a yellowish silt and very fine sand which is many feet deep and of very uniform texture throughout. It contains from 2 to 10 per cent of lime nodules, ranging in size from one-eighth to one-half inch in diameter. These nodules are a characteristic feature of this type of soil.

This soil occurs in a large unbroken body of irregular outline in the northeastern and eastern parts of the area, where it covers about one-half of the present survey. It includes all of Hancock and Dewey townships, nearly all of Hoskins Township, and a large part of Elkhorn and Stanton townships. A smaller area is found northwest of Norfolk.

The Marshall silt loam occupies rolling and hilly topography. The surface is broken by a number of ridges, knolls, and very rolling areas, which have an elevation of from 10 to 150 feet above the bottom land of the area. Often several ridges and knolls rising from 20 to 100 feet are met in traveling a mile along the road, and it is practically impossible to construct roads to avoid these steep, abrupt grades without great expense for excavating and leveling. The small streams throughout this area have cut deep, narrow channels, and even the ordinary rains have gullied this soil considerably.

The Marshall silt loam occupies the highest elevation of any type in the area, and on this account and because of the rolling character of the surface has excellent natural surface drainage. The rain waters run off immediately, especially where the land has never been plowed and is still covered with the native prairie grass. The cultivated areas catch and maintain more of the rainfall than the fields which are pastured or mowed for hay. In the more rolling areas the soil is well drained by the underlying silt and fine sand, and no drainage ditches are necessary.

Washing has been very pronounced in this soil type, and the one serious problem confronting the farmers is how to prevent this too active erosion. As soon as the water breaks through the turf the silt

and fine sand seem to melt away in a short time and a deep gully is the result. More use should be made of hillside ditches for carrying away the surplus water, instead of allowing it to break across the fields, removing the soil and unfitting the surface for cultivation.

The Marshall silt loam is derived from the weathering of loess material of the Pleistocene age. Whatever may be the origin of the loess it has been changed to some extent by weathering since its deposition and by the addition of quite a large quantity of organic matter, giving rise on the surface to a silty or very fine sandy loam. Below 12 inches is found the fresh loess material, composed of yellowish silt and fine to very fine sand, which upon exposure to atmospheric agencies changes to a darker color. This soil is rich in lime, which adds considerably to its productiveness.

The greater part of the Marshall silt loam is under cultivation, while the remainder is pastured or mowed for hay. Corn is the principal product grown upon this soil. It yields from 30 to 45 bushels to the acre. The steeper areas are generally pastured. Only a little alfalfa was seen on this soil, but it was making an excellent growth. Rape is grown here to some extent and used as pasturage for cattle. In addition to being a good soil for general farming purposes it is believed this soil will prove valuable for alfalfa, and careful experimentation with this crop is recommended. Land of this type of soil is worth from $40 to $50 an acre with improvements.

The following table gives mechanical analyses of typical samples of this soil:

Mechanical analyses of Marshall silt loam.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
9937	2 miles N. of Stanton.	Gray silty loam, 0 to 12 inches.	1.81	0.00	0.12	0.12	2.30	21.20	65.92	9.84
9933	2½ miles NW. of Norfolk.	Gray silty loam, 0 to 12 inches.	2.57	.00	.12	.82	5.48	21.70	60.76	11.10
9931	8 miles SE. of Norfolk.	Gray silty loam, 0 to 12 inches.	.08	.00	.38	.24	1.30	22.90	63.20	11.94
9934	Subsoil of 9933	Yellow silty loam, 12 to 36 inches.	.09	.12	.18	.10	.84	18.44	67.70	12.10
9932	Subsoil of 9931	Yellow silty loam, 12 to 36 inches.	Tr.	Tr.	.14	.18	1.04	19.80	65.72	12.98
9938	Subsoil of 9937	Yellow silty loam, 12 to 36 inches.	.53	Tr.	.22	.12	.32	16.70	68.04	13.84

The following samples contained more than one-half per cent of calcium carbonate ($CaCO_3$): No. 9931, 5.06 per cent; No. 9932, 6.21 per cent, No. 9934, 6.73 per cent; No. 9938, 1.67 per cent; No. 9933, 1.13 per cent.

MIAMI FINE SAND.

The surface soil of the Miami fine sand is a grayish or light-colored fine sand with a depth of 8 or 10 inches. The typical areas contain but little organic matter, although in some depressed areas considerable quantities have accumulated near the surface. Scattered here and there in this fine sand occasional knolls of glacial gravel and bowlder clay are found. The subsoil to a depth of 36 inches is a yellowish or light-gray fine sand, loose and incoherent. Both the soil and subsoil are of very uniform texture. This sand is many feet deep in places, and when denuded of its vegetation is shifted by the winds, and one can see large hollows where the material has been blown away.

The largest area of this soil occurs in the southwestern and extreme southern parts of the area in the vicinity of Warnerville and to the south of the Elkhorn River. Another large body is found east and north of Norfolk in Spring Branch and South Branch townships.

The Miami fine sand occupies the rolling and occasionally hilly uplands and has an elevation of from 20 to 80 feet above the bottom lands. The surface is broken by many patches where the soil has been shifted by the wind. The drainage, owing to the rolling surface and to the loose, porous nature of the soil and subsoil, is very good. So rapidly does the surface soil dry that in all typical areas cultivation can be carried on immediately after a rain. It is only in the few depressed areas that the soil is wet, and these are generally kept in grass.

This sand is supposed to be wind-blown material. Some of it may have been brought down by the stream and then carried by wind to its present position.

It has been the opinion of the farmers of this area that it was best not to break the turf of natural prairie grass covering this soil, for as soon as broken, the soil, at least as deep as it is plowed, is shifted badly by the winds. Consequently, only a small proportion of it is under cultivation. The larger proportion is used for pasturage and the production of hay, the more rolling areas being devoted entirely to grazing. Only a part of the level and gently rolling areas are mowed for hay, of which from one-half to three-fourths of a ton per acre is secured. Many large pastures were seen, some containing from 1,000 to 2,000 acres. Corn is the principal crop grown. The yield is light, usually ranging from 10 to 25 bushels an acre, while in dry seasons it falls much below these figures. Potatoes do very well on this soil when it is heavily manured, and some wheat and oats are grown. Alfalfa would probably prove a good crop here if it could be once well established. With careful management and heavy applications of barnyard manure, to improve the mechanical condition of the soil and make it more retentive of moisture, this soil can be made very productive. The incorporation of coarse litter also renders the soil more adhesive, and makes it less subject to shifting by the winds.

The following table shows the texture of typical samples of the soil and subsoil of this type:

Mechanical analyses of Miami fine sand.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
9947	6 miles SW. of Stanton.	Gray fine sand, 0 to 8 inches.	0.21	0.00	1.30	6.64	70.18	16.78	2.40	1.96
9943	1 mile SW. of Warnerville.	Gray fine sand, 0 to 10 inches.	.33	.42	3.38	10.76	61.40	15.14	5.14	3.50
9945	8 miles N. of Norfolk.	Gray fine sand, 0 to 8 inches.	.42	.40	4.56	15.66	53.82	14.26	5.12	6.18
9948	Subsoil of 9947.....	Gray fine sand, 8 to 36 inches.	.14	.00	1.04	8.30	70.38	15.38	2.40	2.40
9944	Subsoil of 9943.....	Yellow fine sand, 10 to 36 inches.	.20	.30	2.62	8.98	62.02	18.68	3.48	3.38
9946	Subsoil of 9945.....	Yellow fine sand, 8 to 36 inches.	.33	.48	4.34	19.44	57.88	10.18	2.22	5.38

ELKHORN SILT LOAM.

The soil of the Elkhorn silt loam consists of a black loamy material grading from a very fine sandy loam in some places to a silty claylike loam in others, and having an average depth of 12 inches. It contains a relatively large proportion of organic matter and when wet appears much like clay, although it is easy to cultivate. The subsoil to a depth of 36 inches is a black loam of the same texture as the soil. In many instances the black loam grades into a yellowish loam at 24 inches, and occasionally it is underlain by a fine sand at 30 inches. All areas of this soil are probably underlain by fine sand at from 3 to 12 feet. Wells dug in this soil usually strike water-bearing sand at a depth of from 8 to 12 feet.

The Elkhorn silt loam lies along the Elkhorn River. This main area, ranging from one-half mile to 2 miles in width, begins at the northwest corner and extends in an unbroken though irregular line to the southeast edge of the survey. There is an extension of this main body passing through Norfolk and out of the survey, and also four detached areas south of the river near the southern boundary of the survey.

This soil occupies level bottom lands and the surface features are very uniform. It has the lowest elevation of any type in the area, lying between 6 and 20 feet above the mean water level of the river. It is subject to inundation during the spring months, and was heavily flooded in 1903. As might be inferred from this the surface drainage is poor. Some areas are just rolling enough to allow the surface water to run off, while in the more level areas the rainfall has to be carried

away in open ditches or allowed to seep through the soil. Nearly all the soil could be drained by open ditches or tile drains, but throughout the area there are depressions, 1 or 2 feet lower than the typical areas, which are too wet to be cultivated, and which are either pastured or used for natural hay meadows. Such areas were observed just west of Norfolk and along the river about 5 miles southeast of Norfolk. In these places is found some alkali, but not in sufficient quantities to cause any trouble as yet. This alkali is due to the imperfect drainage of these slightly depressed areas, where the salts in solution have been brought to the surface by the water and concentrated through evaporation.

The Elkhorn silt loam is sedimentary in origin, being formed from material deposited by the Elkhorn River and its tributaries. It consists of the loess reworked by the river and the fine sand and silt that have been blown in or brought down from the fine sand areas by the smaller streams. Occasionally a thin coating of fine sand added by these agencies is found.

This soil is rightly considered the best agricultural land in the area. Corn ranges in yield from 30 to 60 bushels per acre, wheat from 12 to 30 bushels, oats from 30 to 50 bushels, and sugar beets from 8 to 18 tons. A considerable area is used to produce wild hay, the yield ranging from three-fourths ton to 1¼ tons.

The wetter areas are pastured. Potatoes do fairly well, and where the soil is well drained pumpkins and alfalfa are successfully grown. On the whole this soil appears to be best adapted to corn and sugar beets, these crops doing better here than on the other soils of the area. The Elkhorn silt loam is worth from $40 to $75 an acre.

The following table gives mechanical analyses of samples of the soil and subsoil of this type:

Mechanical analyses of Elkhorn silt loam.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
9941	2 miles SE. of Stanton.	Black silty loam, 0 to 12 inches.	1.85	Tr.	0.28	0.34	5.02	26.36	59.64	8.00
9939	2½ miles NW. of Hadar.	Black loam, 0 to 12 inches.	4.27	0.00	.52	1.50	9.50	24.54	53.80	9.72
9940	Subsoil of 9939.....	Black to yellow loam, 12 to 36 inches.	3.06	.00	.20	.74	5.34	22.24	60.66	10.14
9942	Subsoil of 9941.....	Black to gray loam, 12 to 36 inches.	.95	.00	.16	.30	3.00	20.14	63.90	11.70

The following samples contained more than one-half per cent of calcium carbonate ($CaCO_3$): No. 9939, 0.62 per cent; No. 9940, 1.19 per cent; No. 9942, 2.17 per cent.

ARKANSAS FINE SANDY LOAM.

To a depth of 10 or 12 inches the Arkansas fine sandy loam is either a black or a brown fine sand or sandy loam. The subsoil is a black fine sand grading into a yellow fine sand at 20 to 24 inches and extending to a depth of several feet in most places. The black color is due to the presence of relatively large quantities of organic matter.

This soil occurs in long, narrow areas lying along the Elkhorn River, and also along the North Fork, in the latter case being separated from the river by the Elkhorn silt loam. Some small strips of the soil are also found adjacent to the smaller streams or in the depressed places of the Miami fine sand. One such isolated area is shown in the northwest corner of the area.

The Arkansas fine sandy loam generally occupies an intermediate position between the Elkhorn silt loam and the Miami fine sand. The surface is level or gently rolling, becoming more rolling where the area adjoins the Miami fine sand. A few low sand dunes are found in the bends of the river, where the wind has blown the sand from the river beaches. The elevation of this type is a few feet above the Elkhorn silt loam, and the greater part of it has good surface drainage. Level and slightly depressed areas are sometimes wet, and these could be greatly improved by open surface or underground drains. Tile drains would not need to be placed at short intervals, as the soil is very loose. Occasionally there are wet, boggy places in this type which are covered with water part of the year and support a growth of water-loving grasses.

In origin the type is sedimentary, being formed from material deposited by the Elkhorn River and from the fine sand washed from the Miami fine sand areas. It is very probable, also, that this type has been considerably modified by the addition of wind-blown material.

The Arkansas fine sandy loam is a fairly good agricultural soil. It is mellow and easily tilled. It produces from 20 to 40 bushels of corn, medium yields of wheat and oats, and on the average from 7 to 10 tons of sugar beets. Irish potatoes give excellent results, and alfalfa also does well although only a very small acreage is planted. A considerable quantity of wild hay is cut from the low, moist areas of this type, the yield ranging from one-half to three-fourths of a ton per acre. On the whole, this soil shows special adaptation to potatoes and alfalfa, and it would also be an excellent type on which to introduce truck growing on a commercial scale.

The following table gives mechanical analyses of typical samples of this soil:

Mechanical analyses of Arkansas fine sandy loam.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
9929	1½ miles SW. of Norfolk.	Black fine sandy loam, 0 to 12 inches.	1.36	0.00	0.42	3.98	38.10	31.92	16.20	9.00
9930	Subsoil of 9929.....	Fine sandy loam, 12 to 36 inches.	.72	.00	1.12	3.76	33.16	35.66	19.34	6.42

AGRICULTURAL METHODS.

The latest improved farm machinery is employed in the farm operations of this area, resulting in a great saving in labor, which in this part of the country is scarce and expensive.

When the land was first brought under cultivation the same crop was grown almost without change for a number of years, but in recent years the farmers have begun to realize that a crop rotation is necessary in order to maintain the productiveness of the soil. The crop rotation practiced varies considerably in different parts of the area surveyed. The more common rotation, however, is corn followed by oats and then by wheat, with corn again in the fourth year. It is not uncommon, though, for corn to be grown two or three years in succession before the next step in the rotation is taken. In case of two years of small grain, winter wheat sometimes follows the oats. About one-eighth as much winter as spring wheat is grown in the area, which indicates in a measure the extent to which the latter rotation is followed.

No grass or leguminous crop has yet been introduced in the rotation, as the native prairie grass has been and is still a safe dependence for both hay and pasture. The Elkhorn Valley, which traverses the area from west to east, is noted for its fine natural meadows, and the native prairie sod has been left over much of the Miami fine sand area. The steeper portions of each farm on the Marshall silt loam have also been left in grass and are either used for pastures or mowed for hay. In harvesting, the hay is cut by horse mowers, raked into windrows by means of a large rake, and transported from the windrow by a simple machine to a stacker, which elevates it to the stack, thus saving considerable hand labor.

The corn crop is the most important one in this area. Sulky plows turning either one or two furrows are used in most cases for breaking the land, and it is then put in good tilth with a cutaway or disk harrow.

Corn is planted in hills, usually 3½ feet apart each way, three or four stalks being left in a hill. The crop is in most instances cultivated three times. Level cultivation is commonly practiced in the uplands, while in the lowlands the soil is sometimes left in ridges. Only a small part of the corn is cut and shocked, nearly all being husked from the standing stalks and the grain hauled to bins or piled in heaps near the house. The fields are then pastured, and in the spring a heavy bar is dragged across them, breaking the remaining stalks.

The fields used for corn are plowed the succeeding spring for wheat and oats. Force-feed drills are used to some extent in planting these crops, but the most common seeders sow broadcast and cover the ground faster than the force drill. Spring wheat is sown in March and oats about the first of April. Selfbinders are used entirely for harvesting grain, the greater part of which is thrashed in the field. The straw was formerly burned, but a part is now saved, some of it being fed to cattle and some used as bedding. The value of barnyard manure is not fully appreciated, as the soils are still so productive that it is not greatly needed. It is not an uncommon thing to see barnyard manure thrown on a stream bank, or used to fill up gullies, or to improve a bad place in the road. More care should be taken to preserve the manure, and whether any appreciable difference is noted in the yield or not it should be applied to the fields, for by so doing the soil will be able to maintain its productiveness much longer than if left to the natural processes of recuperation. Some of the farmers are recognizing the fact that the soils are deteriorating, and the decrease in yields is becoming noticeable. The use of commercial fertilizers is unknown in this area.

A few fields of rape were observed on the Marshall silt loam and the Elkhorn silt loam. This crop is grown in the wheat and oat stubble. It is said to do very well, furnishing a succulent pasture with which to supplement the usual dry feeds available for the cattle in the late fall.

The most important thing in connection with the cultivation of sugar beets is the selection of suitable land. The better this is the heavier the tonnage and the greater the profit to the grower. In the preparation of the land deep plowing is very essential, from the fact that the ground in that condition retains moisture better and allows a more perfect development of the beets. The soil should be well pulverized before the seed is sown. To secure the best yield it is necessary to have a good stand, and to this end about 20 pounds of seed should be sown to the acre. The seed should be covered not more than three-fourths of an inch deep. The usual practice in this area is to sow the seed in rows from 18 to 24 inches apart. The cultivation should begin as soon as the beets peep through the ground and be continued till the leaves meet in the center of the rows, when the crop is

ready to lay by. Level cultivation is practiced. As soon as the beets have four or five leaves they should be bunched and thinned. This should not be delayed, as success depends largely on the thinning being done at the proper time. After being thinned the beets are at once hoed by hand, and frequent loosening of the soil by hand and with horse cultivators completes the cultivation. In the latter part of September or first of October the beets are ready to harvest. This is done with a puller made for the purpose, which loosens the beets and leaves them on the ground. After this the beets are topped at the base of the bottom leaf with a corn knife and are ready for delivery at the factory. The tops of the beets and the beet pulp are considered valuable food for cattle, and when the farmer carries a load of beets to the factory he has the privilege of taking a load of pulp home.

AGRICULTURAL CONDITIONS.

At the present time the farmers throughout the greater part of this area are in a very prosperous condition. The situation was very different during the years 1893 and 1895, which were unusually dry. The almost complete crop failures of those years depressed land prices greatly, and there was great discouragement on all hands, but since that time land values have considerably increased, the rainfall has been sufficient for crop needs, production has increased, and the profits have been large.

As a rule, the farmers have good frame dwelling houses, usually painted, and large, well-built barns, capable of housing the work stock and a part of the stock feed during the winter. In addition to the barn, windmills, a few sheds, and other outhouses are commonly seen on every good farm.

The latest improved machinery is to be found on nearly all the farms, but it is seldom cared for as it should be, being left in the open during the winter. Sheds should be provided for housing machinery, as it will frequently deteriorate more rapidly from exposure than from the actual use given it.

Most of the farmers keep several work horses, usually large, able-bodied animals. A few dairy cows are kept, but the large proportion of the stock consists of beef cattle, generally of Shorthorn breed. Nearly every farmer carries a few of these, and some have large herds. A good many hogs and also a few sheep are raised, fattened, and shipped to the larger markets.

The greater number of the farms in the Stanton area are operated by the owners. The remainder are cultivated by tenants under one of three methods. Where a cash rent is paid from $3 to $5 an acre, depending on improvements, the productiveness of the soil, and the location as regards the railroads, is the usual rate. Under the share

system, where the tenant furnishes everything necessary to the work, except the land, generally one-fourth or one-third of the crops is reserved by the landlord. Where the landowner furnishes the stock, feed for the stock, farm machinery, etc., and keeps up repairs, he usually receives one-half of the entire output of the farm as his remuneration.

The size of the farms varies considerably in different parts of the survey. In the Elkhorn silt loam and Marshall silt loam areas the farms contain on the average 160 acres. There are a few smaller farms, and now and then a whole section is farmed under one management. In the Miami fine sand area the individual holdings are generally larger, the greater number of them containing from 320 to 1,280 acres.

Labor is scarce and commands high wages. The laborers are all white and generally quite efficient. Day laborers ordinarily receive from $1.50 to $1.75 a day, and during the busiest seasons, when the small grain is harvested, corn husked, and sugar beets gathered, the wages are considerably higher. Women and children are employed in weeding sugar beets, and on some of the farms women do quite a little other outside work. The scarcity of labor and the resulting high wages have hindered more or less the development of the sugar-beet industry. The same condition has caused the farmers to buy much farm machinery with which to carry on the farming operations.

Corn is and has been the principal product grown in this area, and also in this portion of the State since the country was first settled. Oats, wheat, the native grasses, and sugar beets are the secondary crops of to-day, while the minor crops are potatoes, pumpkins, rye, millet, sorghum, rape, alfalfa, and sweet potatoes. A few dairy cows are kept, but this industry has not flourished to any extent, as the farmers have been so successful that they turn to easier ways of making money than dairying. The dairy business, however, would prove profitable here and will doubtless develop as the country becomes more thickly settled and the land becomes less productive as a result of constant cropping.

Sugar beets are, of course, a money crop, paying fairly well, but so few farmers, in comparison to the number in the area, grow beets, that this crop can not be considered the main money crop. A considerable quantity of oats and some wheat are annually sold, but corn is the mainstay of the agriculture of this area, whether sold direct or fed to cattle. It is the general opinion that it is much more profitable to feed the greater part of the corn and hay to cattle than to sell it.

In addition to the large number of cattle raised here, many herds are shipped in from the west and fed for a few weeks or months before going to the market. This practice consumes a quantity of the grain and hay and leaves a good profit to the man able to carry on

such a business. Sheep are also shipped here for the same purpose from the western part of the State or from Wyoming.

Throughout the area it is generally recognized that the bottom land, mapped as Elkhorn silt loam, is the best corn, sugar-beet, and grass soil found here. It is also known to be a good soil for wheat, oats, and potatoes, and in the lighter and more elevated areas for alfalfa. The Marshall silt loam is also a good soil for corn, oats, wheat, sugar beets, and alfalfa, and some areas of it are used for pasturage, or mowed for hay. In wet seasons land of this type produces better crops than the Elkhorn silt loam. Though not used extensively for alfalfa at present, it will produce this crop better than any of the other soils in the area. The loose subsoil with its relatively large lime content makes the type an admirable one for alfalfa production. The areas of Marshall silt loam used for pasturage are still covered with the native grass.

The Arkansas fine sandy loam is used for all the crops common to this area. It is an excellent potato soil, and is considered a fairly good soil for corn. The large area of Miami fine sand is chiefly used for pasturage, and the native prairie grass still covers the greater part of this type. The low, depressed areas, which are generally wet, are well adapted to the production of wild hay, to which purpose they are at present devoted.

The Stanton area has better railroad transportation facilities than almost any other part of northern Nebraska. The Chicago and Northwestern Railway passes through the area from west to east, and a branch of this road extends north from Norfolk. The Chicago, St. Paul, Minneapolis and Omaha Railroad enters from the northeast corner and terminates at Norfolk, and a branch of the Union Pacific Railroad enters the southern part of the area.

Good dirt roads are found at nearly every section line. In the level areas the roads are good, except for occasional mudholes, but in the Marshall silt loam area there are many ridges and the roads are apt to be rough, and in the sand areas they are very heavy from loose sand. There are several bridges across the Elkhorn River and its branches. Rural free delivery of mail is established throughout the area.

There are no large cities in this area. Norfolk is the largest town and the largest in northeast Nebraska, and has a population of 4,000. Stanton, Winside, and Hoskins are small villages. These places are not of very much importance as markets. The beet-sugar factory is located near Norfolk, and uses all the beets grown within the area. Grain elevators are situated at every station, and the farmers dispose of their grain to the dealers at these places. The cattle and hogs raised and fattened here are shipped to South Omaha and Chicago.

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U.S. DEPT. OF AGRICULTURE
BUREAU OF SOILS
MILTON WHITNEY, CHIEF.

SOIL MAP

NEBRASKA
STANTON SHEET

SOIL PROFILE

Miami fine sand — Sf, Sf

Arkansas fine sandy loam — Ssc, Sf

Marshall silt loam — Sic, Sic

Elkhorn silt loam — Sic, Sic

LEGEND

Sf Fine sand
Ssc Fine sandy loam
Sic Silt loam

LEGEND

Ms — Miami fine sand

Al — Arkansas fine sandy loam

MI — Marshall silt loam

El — Elkhorn silt loam

Soils surveyed by
W. Edward Hearn
1903.

Scale 1 inch = 1 mile

Field Operations
Bureau of Soils
1903.

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